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Closure #: (Outgoing Correspondence Control #, if applicable)

Due Date

J. E. Law

I. B. Paton — **Originator Name**

G. D. DiGregorio — **QA Approval**

A. M. Tyson — **Contractor Manager(s)**

G. H. Setlock — **Kaiser-Hill Program Manager(s)**

Document Classification Review Waiver Per Classification office

T. G. Hedahl — **Kaiser-Hill Director**

Document Subject: KH00003NS1A

TRANSMITTAL OF FY96 WATERSHED IMPROVEMENTS ASSESSMENT REPORTS – AMT-072-96

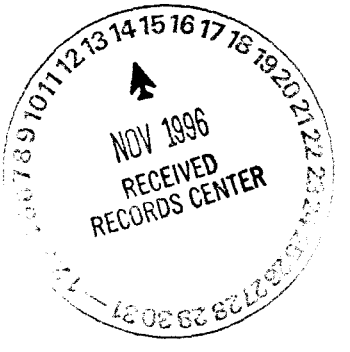
October 16, 1996 96-RM-ER-0188-KH

Discussion and/or Comments:

Enclosed are five copies of the Watershed Improvements Assessment Report for Fiscal Year 1996, Revision 1. This revision reflects changes made by John Stover of the Department of Energy (DOE) to Revision 0, Section 4.2, regarding ecological assessments of planned watershed improvements. Mr. Stover requested that he be sent four copies of the revised report. An additional copy is enclosed for your use.

Please contact Ian Paton of my staff at extension 2680 with questions concerning the report.

cc:
J. E. Law
I. B. Paton
A. M. Tyson
RMRS Records



ADMIN RECORD

ER/WM & I DDT - 7/95

Date

John Stover
Environmental Compliance, Liaison Division
DOE, RFFO

TRANSMITTAL OF FY96 WATERSHED IMPROVEMENTS ASSESSMENT REPORT, REVISION 1 - GHS-XXX-96

Enclosed are four copies, per your request, of the Watershed Improvements Assessment Report for Fiscal Year 1996, Revision 1. This revision reflects changes made by you to Revision 0, Section 4.2 regarding ecological assessments of planned watershed improvements.

Please contact me at extension 4457 if you have any questions or need additional information.

George H. Setlock
Kaiser-Hill, L.L.C.
Compliance and Performance Assurance

GHS:xxx

Enclosures:
As Stated

Watershed Improvements Assessment Report for Fiscal Year 1996

ROCKY MOUNTAIN REMEDIATION SERVICES, L.L.C.

October 1996

Revision 1

TABLE OF CONTENTS

1. INTRODUCTION

1.1 PURPOSE OF SITEWIDE WATERSHED IMPROVEMENTS

The purpose of the watershed improvements implemented at the Rocky Flats Environmental Technology Site (Site) from May through September this year was to stabilize and entrap soils and sediments likely to be transported from the watershed by storm water runoff. Studies have been conducted indicating that, when sources are available, radionuclides may associate with solids suspended in storm water (RMRS, 1996). Storm water data collected at the Site between 1991 and 1995 supports this conclusion (RMRS, 1996). Based on these characteristics of radionuclides and storm water, it is inferred that removing particulate material from storm water runoff should remove radionuclide loading from the water.

In order to minimize the amount of radionuclides being carried from the Site by runoff, a system of controls was implemented to stabilize sediment material and entrap particulate matter suspended in storm water. Drainage areas targeted for control measures were those locations identified as most likely to contribute material that could provide a transport mechanism for radionuclides in Site runoff.

This report provides a brief description of the information used to select locations at the Site for watershed improvements, the types of control measures used, components of the planning process, and a listing of watershed improvement projects completed using fiscal year 1996 funding. In addition, an analysis of water quality at locations downstream from the improvement measures was conducted in an attempt to assess the effectiveness of the various projects. It should be noted that funding for watershed improvements was not approved until midway through the fiscal year, hence the May timeframe for initiating implementation.

1.2 RELATIONSHIP TO RFCA

Site watershed improvements described in this report were implemented to support the Rocky Flats Cleanup Agreement (RFCA). The improvements are intended to minimize transport of material via runoff which could cause Site standards for plutonium and americium (0.15 pCi/L) to be exceeded. The Action Level Framework of RFCA calls for source control measures to be implemented if water quality action levels are exceeded at specific locations upstream from the Site terminal detention ponds. The watershed improvements described herein represent a proactive approach to address concerns regarding the quality of water that flows from the Site prior to and without Action Levels being exceeded.

2. INFORMATION USED TO DETERMINE PROJECT LOCATIONS

Several sources of information, in conjunction with a walkdown of the Site, were used to determine locations of the Site where watershed improvements should be implemented. These information resources are described briefly in Sections 2.1 through 2.6. Maps of these various investigations are contained in the Technical Appendix of the Site Pond Operations Plan (RMRS, 1996).

- Surface water monitoring data
- Gamma spectroscopy data
- Industrial Area sediment quality data
- Industrial Area soils data
- Historical Release Report information
- Site walkdown information

2.1 SURFACE WATER MONITORING DATA

The Industrial Area Interim Measures / Interim Remedial Action (IM/IRA) surface water monitoring program was developed to monitor for contaminant releases caused by decommissioning and demolition activities at the Site. During fiscal year 1996, fifteen (15) automated stations were used to measure flow quantity and collect runoff samples from selected Industrial Area drainage areas. The monitoring strategy used a two-tiered approach, with Tier I stations monitoring relatively larger Industrial Area drainage basins and Tier II stations monitoring smaller sub-basins within the Tier I basins.

- Tier I monitoring consisted of continuously recording, automated stream gaging stations which monitored all surface water leaving the perimeter of the Industrial Area. There were ten Tier I stations established for the IA IM/IRA.
- Tier II monitoring consisted of sub-basin gaging stations in and around areas targeted for decommissioning and demolition activities to provide a high resolution of monitoring for potential releases of materials from those areas. During fiscal year 1996, two Tier II stations were located near Building 889, two Tier II stations were located near the 200 Area fuel oil tanks and one Tier II station was located at the Building 887 Lift Station overflow.

Surface water monitoring will be modified during fiscal year 1997 to support RFCA monitoring requirements.

2.2 GAMMA SPECTROSCOPY DATA

In 1993 and 1994, Industrial Area Operable Units were surveyed by gamma spectroscopy instrumentation using High Purity Germanium (HPGe) detector(s). EG&G personnel used the HPGe instrumentation to measure Americium-241 (Am) activities in IA surficial materials. The gamma spectroscopy (HPGe) data are of limited utility due to the large radius of investigation (about 30 feet) used for the measurements. This radius of investigation created the potential for the detector(s) to measure activity emitted from production buildings (also known as "shine") and also to miss smaller, localized sources. Data mapping indicates that transuranic contamination may be present in the vicinity of building 664, 661, 707, 713/713A, 964, the 904 pad (S. side), and the T891 yard.

Activity detected around Buildings 664, 569 and the 904 pad is suspected to be mostly "shine" from waste stored in these buildings. Nonetheless, these areas were scrutinized during the field inspection activity to evaluate their potential as runoff contaminant sources.

2.3 INDUSTRIAL AREA SEDIMENT QUALITY DATA

From February through April of 1994, OU12 Phase I RCRA Facility Investigation (RFI) field activities culminated in a synoptic, or snapshot in time, sampling project for the industrial area storm water conveyance structures. Fine-grained materials were preferentially sampled from the ditches in order to maximize detection of the transuranic radioisotopes. The ditches were sampled at ditch confluences as well as spatially between confluences to determine source areas of contamination (EG&G, 1995).

Plutonium-239,240 (Pu) and Am activity data in the ditch bottom sediments were mapped and indicate that much of the Site ditch sediments were measured to have less than 0.1 pCi/gram of Pu and Am. However, the data also show that many of the ditches that drain the 700 and 800 Areas were found to have sediments measured at activities greater than 0.1 pCi/gram of Pu and Am. The highest Pu and Am activities are north and east of the Solar Evaporation Ponds and south by southeast of Buildings 771 and 774.

2.4 INDUSTRIAL AREA SOILS DATA

Industrial Area soil samples were collected to satisfy OU8, OU9, OU10, OU12, OU13, and OU14 Phase I Remedial Investigation / RFI data quality objectives. These data show the areal distribution of Pu and Am activities in the soil sediments.

2.5 HISTORICAL RELEASE REPORT INFORMATION

The Historical Release Report provides a listing of all known spills, releases, and incidents involving hazardous substances occurring since the Rocky Flats Plant was opened in 1951. Information was compiled through file review, interviews, site inspections and photographs. For each spill or release

event, documentation provides a physical and chemical description of the constituents released, responses to the events, and the fate of the constituents released to the environment if known.

This report was used to identify which Individual Hazardous Substance Sites (IHSSs) are potential contributors of plutonium and americium-contaminated runoff based on the history of release events. Maps of the Pu-related IHSSs were used to assist in field inspection of potential source areas.

2.6 SITE WALKDOWN INFORMATION

Using the in-situ gamma spectroscopy screening data, soil and sediment data, plutonium-related IHSS information, and with knowledge of surface water monitoring results from different drainage basins, a team of RMRS personnel inspected Industrial Area drainages to identify sources and pathways for transmitting contaminated runoff to the A-, B-, and C-series detention ponds. Inspections were conducted in October 1995 and March 1996. In conjunction with the mapped information, the team looked for the following physical features:

- Erosion on IHSSs,
- Areas of concentrated fine sediments in storm drainage pathways
- Areas which contribute large quantities of runoff (e.g., steep dirt roads, barren hillsides, roof drains, paved areas, and slopes needing revegetation,
- Position of IHSSs in relation to storm water drainage pathways, and
- Overall condition of storm drainage pathways.

Results of the various investigative surveys were used in conjunction with findings from the Site walkdowns to identify areas to be targeted for control measures. Specific control measures implemented in fiscal year 1996 are described in Section 5.

3. TYPES OF IMPROVEMENTS

There were four general types of measures implemented from May through September 1996. Two different hydraulically-applied erosion control products were sprayed on various Site locations, silt fences were installed to capture sediments being transported downstream, and a drainage improvement project was initiated to enhance the capacity of one of the Site's surface water interceptor ditches. Brief descriptions of these types of control measures are included in Sections 3.1 through 3.4.

3.1 EROSION CONTROL / REVEGETATION

SoilGuard®, a hydraulically-applied soil stabilzer and revegetation product, was applied at locations of the Site targeted for erosion control where revegetation was beneficial, such as exposed dirt areas. This material, a combination of wood fibers mixed with a guar gum tackifier and fertilizers, is sprayed on by a certified contractor using a hydroseeding truck. The product can be used strictly as a soil stabilizer, without seed, or sprayed either on top of a seed layer or with seed mixed in with the product itself. It dries within several hours to form a bonded fiber matrix that can withstand heavy rainfall while protecting the top layer of soil. New vegetative growth can protrude through the matrix without disrupting the surrounding sealed area. Impacts on water quality are not a concern with this product (see Appendix A for product data sheets).

Results of SoilGuard applications were encouraging. Three months after being applied, the matrix properties remained intact. A seed mix of native, drought-tolerant grasses was used at all sites. Best revegetation results were achieved on areas that had topsoil imported to the site or at locations that receive some shade.

3.2 EROSION CONTROL / SOIL SEALANT

Areas of the Site targeted for erosion control where revegetation was not practical, such as dirt roads, were applied with TopSeal®. This acrylic copolymer emulsion product is mixed with water and sprayed on using a water truck. It dries within several hours to seal and bind the soil together and is essentially inert in terms of impacting water quality (see Appendix B for product data sheets).

Results of TopSeal applications were encouraging. Four months after the product was applied, sediments at the road edge were clearly sealed and bound together. Roads with a finer grade material cover appear to endure traffic better than do roads with a cover composed of larger diameter rock. It appears that vehicles tend to grind the larger rock into the sealed road, thereby disrupting the sealed layer. It therefore appears that this product is best suited for roads without a rock cover layer or for roads with minimal vehicular traffic.

3.3 SILT FENCES

Silt fences, or "filter fences," were installed in drainage swales in selected locations to prevent transport of sediments. Silt fences used at the Site have a certified opening size of 0.850 mm and allowable flow rate of 15 gallons per minute per square foot of fabric. The fences are resistant to degradation from ultraviolet exposure and biological compounds in the soil (see Appendix C for product data sheets).

Results of the silt fence installations have been relatively encouraging. In those areas where exposed soil exists upstream from the fence, evidence exists of sediment deposition occurring on the upstream side of the fence, an indication that the fences are functioning as intended.

3.4 DRAINAGE IMPROVEMENTS

In addition to applying erosion control products and installing silt fences, another type of watershed improvement project, drainage improvement, was initiated in September 1996. Trees are choking several sections of the South Interceptor Ditch (SID). In order to enhance the capacity of the channel to carry runoff from the south side of the Industrial Area, work began to remove the problem trees after the ecological impacts of the project were assessed and permission was granted from the U.S. Fish and Wildlife Service (see Section 4.2).

The SID was originally designed to accommodate a 100-year, 6-hour storm event. Several factors, including sedimentation in the channel, bank erosion, and vegetative growth in the channel, have restricted the original channel capacity. The tree removal project was started as an initial effort to increase the SID capacity to prevent flow from a large storm event overtopping the channel and flowing into Woman Creek.

4. PLANNING COMPONENTS

Watershed improvement activities were approved by the Master Activities List (MAL) Identification Team, as part of Baseline-12, to provide functional radiation protection capability. Planning for specific watershed improvements was conducted through the Site Integrated Work Control Process (IWCP). In addition to personnel from the Sitewide Surface Water group, this required the involvement of personnel from multiple disciplines around the Site, including Safety, Ecology, Soil Disturbance, Waste Management and Radiological Protection organizations. A brief description of these planning components is included in the following sections.

4.1 SAFETY PLANNING

All work performed in conjunction with the Watershed Improvements Plan was reviewed by an RMRS Health and Safety representative. In instances where chemicals were applied or used, an MSDS for the compound was reviewed and kept on file. Prior to work being initiated, safety issues for the particular project were discussed during the pre-evolution meeting.

4.2 ECOLOGICAL ASSESSMENTS

Buffer zone areas where watershed improvements were planned were first assessed by Site personnel from the Natural Resource Protection and Compliance Program. Issues reviewed included each project's potential impact on:

- Migratory bird nesting sites
- Preble's Mouse habitat
- Wetlands issues
- Endangered species

If a proposed watershed improvement project has the potential to significantly impact wildlife habitat, then DOE will consult with, and may request a site visit by, the U. S. Fish and Wildlife Service (USFWS). Involvement of the USFWS is in addition to the ecological review conducted by Site personnel for each project.

In September 1996, a tour of the South Interceptor Ditch (SID) was conducted with a representative from the USFWS and Site personnel from RMRS, Kaiser-Hill and DOE to assess potential impacts of removing overgrown vegetation from the SID. Trees with bird nests had previously been identified and flagged to not be removed. The USFWS officer gave his approval to the tree removal project.

4.3 SOIL DISTURBANCE PERMITS

In cases where the planned implementation of watershed improvements would cause breaching of the soil surface, a Soil Disturbance Permit was obtained. This required involvement of RMRS Environmental Restoration staff and the Soil Disturbance Permitting Committee. A review of each specific site history was performed and, where relevant, soil sampling data was reviewed prior to permission being granted for soil to be disturbed.

4.4 WASTE DETERMINATION AND DISPOSAL

Watershed improvements implemented near Building 884 involved removing sediments accumulated in a paved drainageway. Sediment sample data was reviewed by personnel from Radiological Protection and a plan for removal of the sediments was established after determining the material (approximately 6 pCi/gram Pu) was a low-level waste based on having roughly twice the Pu activity of background. Waste Technicians removed and drummed the sediments and a certified Waste Generator supervised the work. The drums are being held in a waste storage cargo container pending Sitewide determination of disposal options for soils with low-level activity.

5. WATERSHED IMPROVEMENTS COMPLETED / WATER QUALITY IMPACT ANALYSIS

This section contains a listing of watershed improvement projects completed using fiscal year 1996 funding. The listings are categorized by drainage basin, and subdivided by individual improvement projects. For each project, a description is provided of the rationale for the control measure, the nature of work performed, the date of completion, and an assessment of the project's impact on downstream water quality.

This water quality impact analysis involves a review of storm water data from sites downstream of the various watershed improvements discussed. Plots in this section present Pu activity versus flow rate at the gaging station, with historical (pre-improvement data points) unlabled and post-improvement data points labled. Flow rate must be incorporated into the analysis, versus looking at radionuclide activity only, because large storm events tend to stir up different amounts of material than smaller events. These relationships are unique for each drainage basin. Unfortunately, few data points exist for each drainage for radionuclide activity in storm water for samples collected after individual watershed improvements were implemented. Therefore, trends in the data can be reviewed, but it is currently inappropriate to infer impacts on watersheds caused by these improvements based on the limited data available for the post-improvement timeframe.

5.1 NORTH WALNUT CREEK DRAINAGE

5.1.1 Building 779 - East Side

Rationale:

- Soil survey: Pu activity one order of magnitude higher than surrounding area.
- Historical Release Report: Pu-related IHSSs in sub-basin (IHSSs 150.6, 150.8).
- Storm Drainage: drain located in midst of exposed dirt area flows directly to station SW093.
- Field inspection: evidence of erosion from exposed dirt area.

Improvement Implemented: SoilGuard® applied to approximately 800 square yards.

Date Completed: 6/24/96

Water Quality Impact Analysis: Storm water data from gaging station SW093, downstream from this project site, are shown in Figure 1. Data point from 7/9/96, after improvement implemented, indicates a relatively low activity when compared to other data points (data point below the "data trend" indicates lower relative actinide load per unit volume of storm water). One data point, however, is not sufficient to determine the impact on the SW093 watershed.

5.1.2 Building 774 - East Hillside

Rationale:

- Sediment survey: activities amongst highest at Site (0.800 pCi/g Pu and 0.990 pCi/g Am) .
- Historical Release Report: Pu-related IHSSs in sub-basin (IHSSs 124, 125, 149, 163.1).
- HPGe Survey: activity one order of magnitude higher than surrounding area.
- Storm Drainage: drain located at bottom of road flows directly to station SW093.
- Field inspection: evidence of erosion from exposed dirt area.

Improvement Implemented: TopSeal® applied to approximately 2500 square yards of dirt road.
Date Completed: 8/14/96
Water Quality Impact Analysis: Storm water data from gaging station SW093, downstream from this project site, are shown in Figure 1. No storm water sample results were available for SW093 after this improvement was implemented.

5.2 SOUTH WALNUT CREEK DRAINAGE

5.2.1 Building 707 - West Side

Rationale:

- Historical Release Report: Pu-related IHSSs in sub-basin (IHSSs 159, 150.5, 123.2, 150.2).
- HPGe Survey: area west of 707 shows Am activity.
- Storm Drainage: drain surrounded by exposed dirt flow to station GS10.
- Field inspection: evidence of erosion from exposed dirt areas.

Improvement Implemented: SoilGuard® applied to approximately 3200 square yards.
Date Completed: 6/24/96
Water Quality Impact Analysis: Storm water data from gaging station GS10, downstream from this project site, are shown in Figure 2. Data point from 7/9/96, after improvement implemented, indicates a relatively low activity when compared to other data points (data point below the "data trend" indicates lower relative actinide load per unit volume of storm water). One data point, however, is not sufficient to determine the impact on the GS10 watershed.

5.3 ROAD BETWEEN 903 AND 904 PADS

Rationale:

- Soil Survey: 903 Pad has some of Site's highest activities (120 pCi/g).
- Historical Release Report: Pu-related IHSSs in sub-basin (IHSSs 112, 155, 213).
- HPGe Survey: 904 Pad area has high measured gamma activity for Site (9 to 50 pCi/g).
- Storm Drainage: Storm water flows north to Central Avenue Ditch and on to station GS10.
- Field inspection: evidence of sediment depostion in roadside ditches.

Improvement Implemented: TopSeal® applied to approximately 2500 square yards of dirt road.

Date Completed: 8/1/96

Water Quality Impact Analysis: Storm water data from gaging station GS10, downstream from this project site, are discussed in Section 5.2.1. No storm water sample results were available for GS10 after this improvement was implemented.

5.3.1 Building 884 - South Side

Rationale:

- Surface Water Monitoring: data from Station GS27, downstream, measured approximately 26 pCi/L average for Pu (two orders of magnitude above RFCA Point of Compliance standards).
- Sediment Survey: Pu activity (0.18 to 0.23 pCi/g) measured order of magnitude above downstream sediments.
- Historical Release Report: Pu-related IHSS in sub-basin (IHSSs 164.3).
- Storm Drainage: Storm water flows north to GS27 and on to station GS10.
- Field inspection: evidence of sediment deposition on pavement south of Building 884.

Improvement Implemented: Sediments removed from pavement (7 drums) and TopSeal® applied to approximately 600 square yards.

Date Completed: 8/15/96 (sediment removal) and 10/1/96 (TopSeal® application).

Water Quality Impact Analysis: Storm water data from gaging station GS27, downstream from this project site, are not shown because no storm water sample results were available for GS27 after these improvements were implemented.

5.4 SOUTH INTERCEPTOR DITCH DRAINAGE

5.4.1 903 Pad Lip Area - Buffer Zone Road Down to Pond C-1

Rationale:

- Surface Water Monitoring: data from the water flowing down the road during the May 1995 storm event measured ranged from 2.98 to 247.5 pCi/L average for Pu (RMRS, 1995).
- Soil Survey: Highest Pu activity at Site 903 Pad Lip Area hillside (up to 2897 pCi/g).
- Historical Release Report: Pu-related IHSS in sub-basin (IHSSs 109, 112, 155).
- Storm Drainage: Storm water flows south to SID and on to station SW027.

- Field inspection: evidence of erosion on road.

Improvement Implemented: Road closed permanently and SoilGuard® applied in spring for erosion control. In September, topsoil imported, area seeded, and SoilGuard® reapplied.

Date Completed: 5/28/96 (first SoilGuard®) and 9/17/96 (revegetation completed).

Water Quality Impact Analysis: Storm water data from gaging station SW027, downstream from this project site, are shown in Figure 3. Data points from 5/29/96 and 6/15/95, after the first application of SoilGuard®, indicate relatively low activities when compared to other data points (data point below the "data trend" indicates lower relative actinide load per unit volume of storm water). Two data points, however, are not sufficient to determine the impact on the SW027 watershed.

5.4.2 903 Pad Lip Area - Road South and East of Pad

Rationale:

- See description in Section 5.4.1.

Improvement Implemented: TopSeal® applied to approximately 5,000 square yards of dirt road located on the south and east sides of the 903 Pad Lip Area.

Date Completed: 10/1/96

Water Quality Impact Analysis: Storm water data from gaging station SW027, downstream from this project site, are shown in Figure 3. No storm water sample results were available for SW027 after this measure was implemented.

5.4.3 903 Pad - Hillside Above South Interceptor Ditch

Rationale:

- See description in Section 5.4.1.

Improvement Implemented: Installed six silt fences in selected drainage swales (approximately 300 linear feet of fence).

Date Completed: 6/10/96

Water Quality Impact Analysis: Storm water data from gaging station SW027, downstream from this project site, are shown in Figure 3. Data point from 6/15/95, after the silt fences were installed, indicates relatively low activity when compared to other data points (data point below the "data trend" indicates lower relative actinide load per unit volume of storm water). One data point, however, is not sufficient to determine the impact on the SW027 watershed.

5.4.4 South Interceptor Ditch (SID)

Rationale:

- The SID captures runoff from the southern portion of the Industrial Area and flows into Pond C-2. This area includes the 400 Area, 800 Area and 903 Pad Lip Area discussed in Sections 5.4.1 and 5.4.3 above.

- SID Study: Flow restrictions in the SID have been studied and documented. Removing trees from the channel is afirst step in enhancing the SID capacity (EG&G, 1994).

Improvement Implemented: Plan to remove approximately 185 trees and 7000 square yards of brush from the channel.

Date Completed: Ongoing as of 10/10/96 (continued in FY97).

Water Quality Impact Analysis: No storm water data from gaging station SW027, downstream from this project, have been collected since the tree removal work was initiated. In addition, this project is meant not to stabilize sediments and enhance water quality, but rather to improve the capacity of the SID to contain runoff from the southern portion of the Industrial Area.

Figure 1: North Walnut Creek Storm Water Pu Activity vs. Flow Data

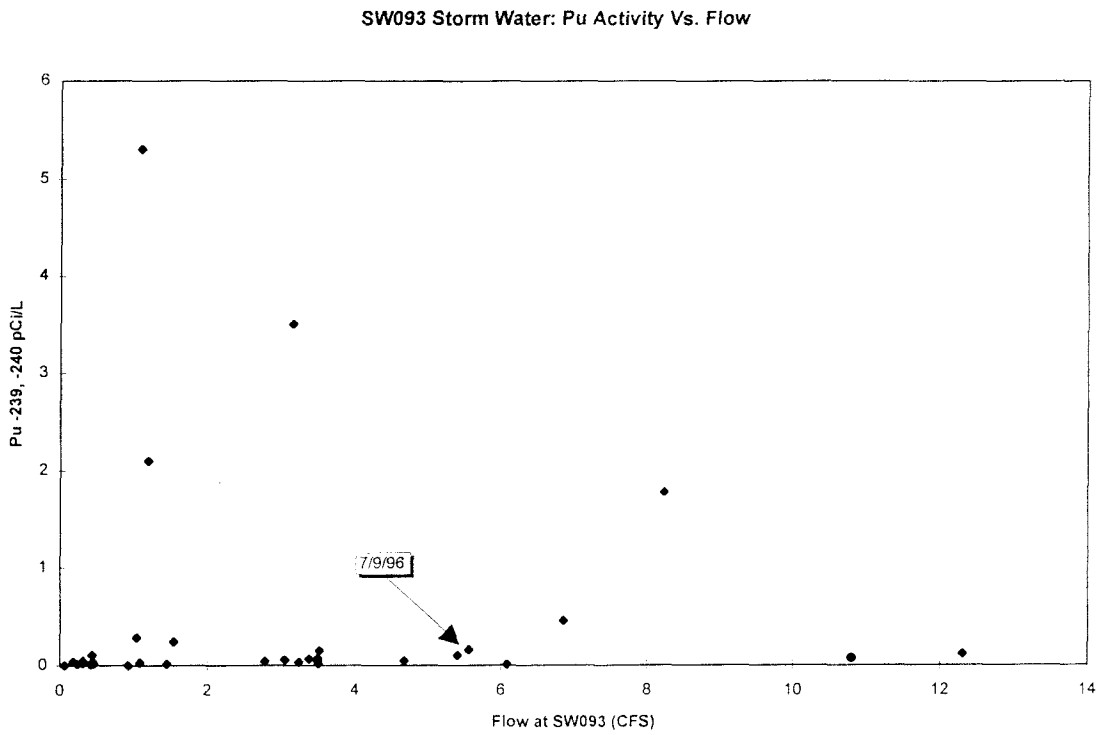


Figure 2: South Walnut Creek Storm Water Pu Activity vs. Flow Data

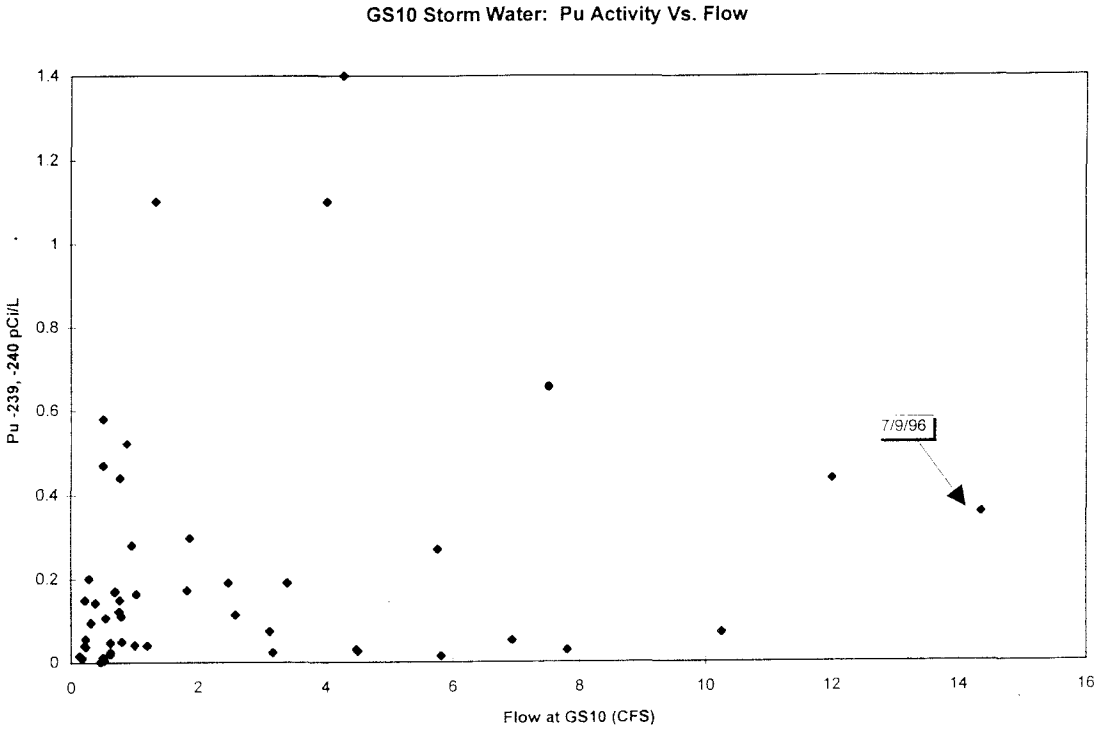
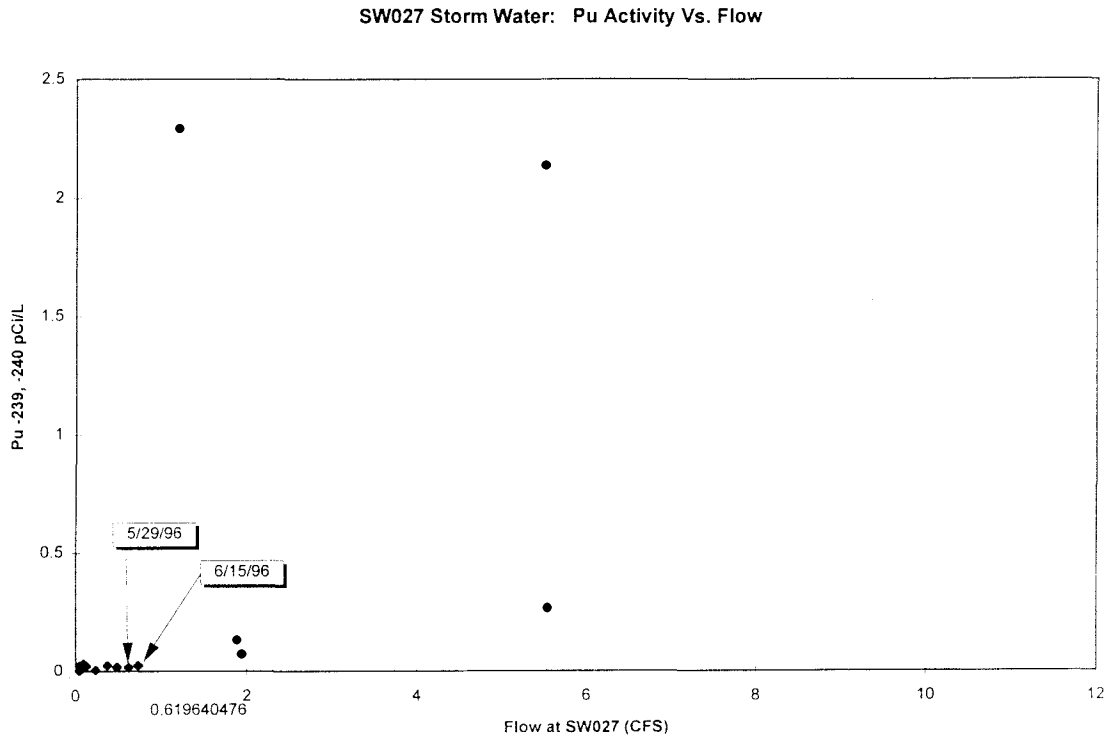


Figure 3: South Interceptor Ditch Storm Water Pu Activity vs. Flow Data



6. REFERENCES

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EG&G, 1995, Technical Memorandum No. 1, Industrial Area Surface Water and Sediment Field Sampling Plan; Addendum to Phase I RFI/RI Work Plan, Operable Unit No. 12, Manual No. RF/ER-94-00048. Rocky Flats Environmental Technology Site, Golden, CO.

RMRS, 1996. Pond Operations Plan: Technical Appendix, Rocky Flats Environmental Technology Site, Golden, Colorado.

RMRS, 1995. Evaluation of Selected Rocky Flats Environmental Technology Site OU2 Storm-Water Radiochemistry for May 1995, Rocky Flats Environmental Technology Site, Golden, Colorado.

7. APPENDICES

Appendix A - Soil Stabilizer Information

Appendix B - Unpaved Road Stabilizer Information

Appendix C - Silt Fence Information

Appendix A - Soil Stabilizer Information

Weyerhaeuser SOIL GUARD® BONDED FIBER MATRIX

ENGINEERED FIBER PRODUCTS

7001 396th Ave. SE • Snoqualmie, WA 98065-9903 • Tel: 1-800-443-9179 • Fax 206-924-7148

SOIL GUARD® SPECIFICATIONS

The Bonded Fiber Matrix (BFM) shall be Soil Guard® as manufactured by the Weyerhaeuser Company. The Bonded Fiber Matrix is hydraulically applied and upon drying adheres to the soil in the form of a continuous 100% coverage biodegradable erosion control blanket. The Bonded Fiber Matrix is comprised of long strand wood fibers held together by a bonding agent which, upon drying, becomes insoluble and non-dispersible.

The matrix which forms shall be designed, tested and proven to perform in a manner superior to biodegradable erosion control blankets as measured by reduced water runoff, reduced soil loss, and faster plant establishment. The formed matrix shall meet the following requirements:

1. The binder shall not dissolve or disperse upon rewetting.
   This provides continued protection.
2. The matrix shall have no holes > 1mm in size.
   This eliminates direct rain drop impact.
3. The matrix shall have no gaps between product and soil.
   This reduces soil loss.
4. The matrix shall have water holding capacity of 1000g/100g (1.2 gal/lb matrix).
   This reduces water runoff and accelerates plant establishment.
5. The matrix shall have no germination or growth inhibiting factors and does not form a water insensitive crust.
   If present, these factors restrict germination and growth.
6. The matrix shall be comprised of materials 100% biodegradable and 100% beneficial to plant growth.

Soil Guard® shall be installed at a rate of 3,000 - 4,000 pounds per acre by certified applicators according to manufacturers instructions utilizing standard hydraulic planting equipment. The applicator shall not apply Soil Guard® in advance of rainfall, such that Soil Guard® has an opportunity to dry for up to 24 hours after installation.

Manufacturer Name and Address:
Weyerhaeuser Company
Tacoma WA 98477
Emergency Phone: (206) 924-5000
Additional Information: (206) 924-3865

Material Safety Data Sheet

Soil Guard

1 Product Identification

Product	Manufacturing Location
Soil Guard	Snoqualmie, WA

Synonyms: Bonded Fiber Matrix
Date Prepared: 07/02/93
Date Revised: 05/01/95
Prepared by: Corporate Safety & Health

2 Hazardous Ingredients/Identity Information

Chemical or Common Name CAS#	Percent	OSHA Current Exposure Limits	
Wood CAS# None	>88	OSHA PEL-TWA OSHA PEL-TWA ACGIH TLV-TWA ACGIH TLV-STEL ACGIH TLV-TWA	15 mg/m³ (a) 5 mg/m³ (b) 5 mg/m³ (c) 10 mg/m³ (c) 1 mg/m³ (d)
		Recommended Exposure Limits[1]	
		PEL-TWA[1] PEL-STEL[1] PEL-TWA[1]	5 mg/m³ (e) 10 mg/m³ (e) 2.5 mg/m³ (f)
Yellow 46L (Methine dye) CAS# Propretary	<1	OSHA PEL-TWA ACGIH TLV-TWA	None None
Polysaccharide Powdered Tackifier (Guar Gum) CAS# None	*10*	*OSHA PEL-TWA* ACGIH TLV-TWA	*None* None
Trade Secret CAS# Proprietary	<1	OSHA PEL-TWA ACGIH TLV-TWA	None None
Trade Secret CAS# Proprietary	<1	OSHA PEL-TWA ACGIH TLV-TWA	None None

(a) total dust
(b) respirable dust fraction
(c) softwood total dust
(d) selected hardwood total dust (beech, oak, others)
(e) softwood or hardwood total dust
(f) Western red cedar total dust

[1] Weyerhaeuser recommended exposure limits based on 1989 OSHA PELs

In 1992, the U.S. Court of Appeals for the Eleventh Circuit Court overturned OSHA's 1989 Air Contaminants Rule, which included specific PELs for wood dust established by OSHA at that time. Wood dust is now officially regulated as an organic dust in a category known as "Particulates Not Otherwise Regulated" (PNOR), or Nuisance Dust. However, a number of states have incorporated the OSHA PELs from the 1989 standard in their state plans. Additionally, OSHA has announced that it may cite companies under the OSH Act general duty clause under appropriate circumstances for noncompliance with the 1989 PELs.

Appearance and Odor:
Dyed, yellow wood fiber with slight, woody odor. The wood component consists mainly of alder.

3 Physical/Chemical Characteristics

BOILING POINT (@ 760 mm Hg):	NAP
VAPOR PRESSURE (mm Hg):	NAP
VAPOR DENSITY (Air=1; 1 atm):	NAP
SPECIFIC GRAVITY (H_2O=1):	0.06 - 0.30
MELTING POINT:	NAP
EVAPORATION RATE (Butyl Acetate=1):	NAP
SOLUBILITY IN WATER (% by Weight):	ca. 10%
% VOLATILE BY VOLUME @ 70°F (21°C):	0

4 Fire and Explosion Hazard Data

Flash Point (Method Used): NAP
Flammable Limits:
LEL: See below under "Unusual Fire and Explosion Hazards"
UEL: NAP
Extinguishing Media:
Water, carbon dioxide, sand
Autoignition Temperature:
Variable [typically 400-500°F (204-260°C)]
Special Firefighting Procedures:
None.
Unusual Fire and Explosion Hazards:
Depending on moisture content, and more importantly, particle diameter, wood dust may explode in the presence of an ignition source. An airborne concentration of 40 grams (40,000 mg) of dust per cubic meter of air is often used as the LEL for wood dust.

5 Reactivity Data

Stability:
( ) Unstable (x) Stable
Conditions to Avoid:
Avoid open flame. Product may ignite at temperatures in excess of 400°F (204°C).
Incompatibility (Materials to Avoid):
Avoid contact with oxidizing agents.
Hazardous Decomposition or By-Products:
Thermal decomposition products include carbon monoxide, carbon dioxide, aliphatic aldehydes, rosin acids, terpenes, and polycyclic aromatic hydrocarbons.
Hazardous Polymerization:
( ) May Occur (x) Will Not Occur

6 Precautions for Safe Handling and Use

Steps to be Taken In Case Material Is Released or Spilled
Wood dust may be vacuumed or shoveled for recovery or disposal. Avoid dusty conditions and provide good ventilation. Use NIOSH/MSHA-approved respirator and goggles where ventilation is not possible.
Waste Disposal Method:
If disposed of or discarded in its purchased form, incineration is preferable. Dry land disposal is acceptable in most states. It is however, the user's responsibility to determine at the time of disposal whether your product meets RCRA criteria for hazardous waste. Follow applicable federal, state and local regulations.

Appendix B - Unpaved Road Stabilizer Information

Environmentally Safe
Cost Effective
Easy to Use

TOP-SEAL

Dust Control
Erosion Control
Stabilization

Liquid Soil Sealant and Dust Control

MATERIAL SAFETY DATA SHEET (MSDS)

MANUFACTURER'S INFORMATION

MANUFACTURER'S NAME: Soils Control International, Inc.

ADDRESS: 1711 E. Central Texas Expressway, Suite 312
Killeen, Texas 76541

EMERGENCY TELEPHONE NUMBERS:

Soils Control International, Inc.:	(817) 554-5270
National Response Center:	(800) 424-8802
Alternate Emergency Number:	(817) 526-5550

DATE PREPARED: April 1, 1994

SUPERSEDES: MSDS Dated: January 1, 1993

SECTION I - IDENTITY

COMMON NAME:(Used on Label):
TOP-SEAL Liquid Soil Sealant and Dust Control

CHEMICAL NAME / CHEMICAL FAMILY:
Acrylic Copolymer Emulsion / Proprietary

CAS NUMBER:
Blend

TRANSPORTATION CLASSIFICATION:
Item No. 35260 / Class 55

INTERNAT'L HARMONIZATION CODE:
Schedule B / No. 3209.10.0000

SECTION II - HAZARDOUS INGREDIENTS

PRINCIPAL HAZARDOUS COMPONENTS	%	TLV (Units)	PRODUCT CAS #
Proprietary Acrylic	39-	None established	Trade secret
Polymer Blend	41	—	—
Individual Monomers	Conf.	None established	Trade secret
Triethylamine	< 1	OSHA PEL 10 ppm	121-44-8

All ingredients in this product are on the TSCA Inventory List.

SECTION III - PHYSICAL and CHEMICAL CHARACTERISTICS

BOILING POINT: 212°F

FREEZING POINT (F): 32°F

SPECIFIC GRAVITY (H^2O = 1): 1.1

VAPOR PRESSURE (mm Hg): 17.5

VAPOR DENSITY (Air = 1): < 1

SOLUBILITY IN WATER: Diluteable

REACTIVITY IN WATER: None

PH INFORMATION: 8.5

APPEARANCE & ODOR: Milky White Liquid/Mild Amine Odor

SECTION IV - FIRE & EXPLOSION DATA

FLASH POINT: Non-Flammable Liquid

EXTINGUISHER MEDIA: Determined by surrounding materials: CO2 Foam, Dry Powder, Water, spray or fog.

SPECIAL FIRE FIGHTING PROCEDURES: None

FLAMMABLE LIMITS (In air % by Volume): N/A

AUTO-IGNITION TEMPERATURE: N/A

UNUSUAL FIRE & EXPLOSION HAZARDS: Material can splatter above 212 F. Polymer film can burn.

SEC V - PHYSICAL HAZARDS

STABILITY: Stable

CONDITIONS TO AVOID: Excessive Heat, and *FREEZING TEMPERATURES*

INCOMPATIBILITY (Materials to avoid):
Oxidizers or Oxidizing materials

DECOMPRESSION PRODUCTS: From Fire, Smoke, Carbon Dioxide, and Carbon Monoxide

HAZARDOUS POLYMERIZATION: N/A

POLYMERIZATION TO AVOID: None

MATERIAL SAFETY DATA SHEET (MSDS) - Page 2

SECTION VI - HEALTH HAZARDS DATA

PRIMARY ROUTE(S) OF ENTRY:	Skin contact	Inhalation	Ingestion
	Possible Irritant	Possible Irritant	Possible Irritant

HEALTH HAZARDS: Possible irritation to skin and eyes. Vapor in an enclosed environment or excessive mist can irritate nose and throat, and cause headache and nausea.

CARCINOGENICITY:	NTP	IARC MONOGRAPHS	OSHA REGULATED
	No	No	No

OVER EXPOSURE EFFECTS: Inhalation of vapor or mist can cause the following: headache, nausea, irriation of the nose, throat, and lungs.

FIRST AID PROCEDURES: In case of eye contact, flush immediately with plenty of water for at least 15 minutes and get medical attention; for skin, wash thoroughly with soap and water. If affected by inhalation of vapor or spray mist, remove to fresh air. If swallowed, do not induce vomiting, get immediate medical attention.

SECTION VII - SPILL / LEAK PROCEDURES

RELEASED OR SPILLED: Absorb with inert material and dispose of in accordance with applicable regulations.

WASTE DISPOSAL METHOD: Follow State Regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

***NOTE*: Safe handling of any chemicals is always recommended. The following procedures are recommended for this product as well.**

RESPIRATORY PROTECTION (Specify type): Use NIOSH-approved respirator for particulates if possibility exists for overexposure to mist.

VENTILATION: Use local exhaust or dilution ventilation if exposures exceed the permissible limit.

PROTECTIVE GLOVES: Yes, if direct handling of liquid is imminent.

EYE PROTECTION: chemical-type goggles or face shield should be used as splashes to the eyes may occur.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: As required by local policy and in accordance with HMIS PERSONAL PROTECTION: C: Safety Glasses, Gloves, Apron.

SECTION IX - SPECIAL HANDLING

HANDLING AND STORAGE: Do not store above 120° F or below 32° F.

PRECAUTIONARY MEASURES: Provide fresh air ventilation during and after application. Close container after each use. Avoid contact with skin, eyes, and clothing. After handling this product, wash hands before eating, drinking, or smoking.

HAZARD CLASS: Non-Regulated

DOT SHIPPING NAME: DOT Non-Regulated - TOP-SEAL

REPORTABLE QUANTITY (RQ): None

UN NUMBER: None

NA #: None

PACKAGING SIZE: Drum & Bulk

Table 1 - Properties

Property	Value
Solids	39% minimum
pH	8.5
Viscosity (LVF #3 funnel @ 60 RPM)	250 cps max.
Tg (C)	-5 - +25
Appearance	Milky White
Odor	Slight Amine
Solubility in Water	Dilutable
Solubility after Curing	Insoluble
Density	9.17 per Gal
Specific Gravity	1.1
Non-Violatiles	39-41%
Proprietary Compounds	Virgin Raw Materials

Table 2 - Animal Toxicity Studies

	Top-Seal Individual Emulsions			
Test Conducted	A	B	C	D
Skin Irritant-Rabbit-Draize Test, 8 = most severe	Rated at 3.2	Rated at 2.6	Rated at 2.3	Rated at 1
Eye Irritant - Rabbit	SI Mod	SI	SI Mod	—
Acute Inhalation (Aerosol)-Rat- mg/l-1 hr.	>38	>9.56	>7.9	>25 (4 hr.)
Acute Oral - Rat LD50, mg/kg	> 5000	> 5000	> 50,000	> 5000
Acute Dermal - Rabbit LD50, mg/kg	> 5000	> 5000	> 5,000	> 2000
Repeated Insult Patch Test - Humans				
Irritant	Negative	Negative	Negative	Negative
Fatiguing Agent	Negative	Negative	Negative	Negative
Sensitizer	Negative	Negative	Negative	Negative

Table 3 - Fish Toxicity Studies

Top-Seal Individual Emulsions	Type of Fish	Hours	LC50 PPM
A	Rainbow Trout	24	> 10,000
B	Rainbow Trout	96	8,950
C	Bluegill Sunfish	24	10,000
D	Bluegill Sunfish	96	5,640
E	Goldfish	24	4,200
F	Goldfish	24	7,500
G	Goldfish	24	10,000
H	Goldfish	24	13,400
I	Goldfish	24	13,400
J	Goldfish	24	24,000
K	Goldfish	3	24,000
Top-Seal	Goldfish	72	12,500 - 20,000

SPECIAL NOTES:

1. The data shown above indicates that the LC50 for Top-Seal contains a level of toxicity which has litt or no effect on goldfish or other types of aquatic forms. It should be noted that chemicals must be labeled "TOXIC TO FISH" if the LC50 is less than 1.0 ppm.

2. Top-Seal, in its liquid form, is dilutable in water. This allows for the convenience of efficient delivery into the soil. After the product has been applied to the soil, it begins the process of curing and will eventually be irreversibly transformed from a liquid to a solid. Top-Seal, once cured, will not resolubolize and will not re-disperse in the presence of moisture.

3. The combination of a very safe chemical composition and the ability to remain insoluble makes Top-Seal an excellent choice for use in areas where mobility in the soil and drinking water safety are a factor.

Appendix C - Silt Fence Information

SYNTHETIC INDUSTRIES
CONSTRUCTION PRODUCTS DIVISION
"Smart Solutions in Synthetics"

SILT CHEK™ 910SC
Silt Fence Geotextile

SILT CHEK™ 910SC is a woven slit film geotextile manufactured at one of Synthetic Industries' facilities that has achieved ISO-9002 certification for its systematic approach to quality. The individual slit films are woven together in such a manner as to provide dimensional stability relative to each other. The construction of the geotextile allows for adequate water flow and soil retention normal to the plane of the geotextile, which makes the SILT CHEK™ 910SC ideal for silt fence systems. The geotextile is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils. Synthetic Industries SILT CHEK™ 910SC conforms to the property values listed below:

PROPERTY	TEST METHOD	MINIMUM AVERAGE ROLL VALUES[1]	
		English	Metric
Mechanical			
Grab Tensile Strength	ASTM D4632	100 x 100 lbs	445 x 445 N
Grab Elongation	ASTM D4632	15 x 15 %	15 x 15 %
Puncture Strength	ASTM D4833	58 lbs	255 N
Mullen Burst	ASTM D3786	265 psi	1820 kPa
Trapezoidal Tear	ASTM D4533	50 x 50 lbs	220 x 220 N
Hydraulic			
Apparent Opening Size (AOS)	ASTM D4751	20 US Std. Sieve	0.850 mm
Permittivity, Ψ	ASTM D4491	0.20 sec^{-1}	0.20 sec^{-1}
Water Flow Rate	ASTM D4491	15 gpm/ft^2	610 $l/min/m^2$
Endurance			
UV Resistance (% retained @ 500 hours)	ASTM D4355	90 %	90 %

Notes:

1 Values shown are machine (warp) x cross-machine (fill) direction. Minimum average roll values represent a 95 percent confidence level, calculated as the mean minus two standard deviations.

Standard Roll Size: 24", 36" or 42" Wide, Variable Lengths Available

4019 Industry Drive • Chattanooga, TN 37416 • 615/899-0444 FAX 615/899-7619 Toll Free 800/621-0444